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ABSTRACT

The Ad Hoc Committee on Future Information Services explored possible future directions for information services at Texas A&M University Library and developed a plan to guide the library into the next decade in terms of automated access to information. In exploring future directions for automated information services, the committee members researched and wrote papers on the following topics: (1) the user; (2) information; (3) access to information, including means and technology; (4) the role of libraries and librarians in the future; (5) macro and micro organizational considerations for libraries in the future; and (6) fiscal considerations. These papers are appended. The body of the report consists of a series of recommendations that rest on the concept of utilizing technology to enhance levels of service. The overall aim is to have the funds and trained library personnel available to provide both traditional materials and on-line informational access for users at no charge. (THC)

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# FUTURE INFORMATION SERVICES AT THE TEXAS A&M UNIVERSITY LIBRARY: BACKGROUND AND RECOMMENDATIONS (REPORT OF AN AD HOC COMMITTEE)

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REPORT OF THE AD HOC COMMITTEE ON FUTURE INFORMATION SERVICES

Introduction

The charge to the Ad Hoc Committee on Future Information Services was to explore future directions for informational services at Texas A&M University Library and to develop a plan to guide the Library in terms of automated access to information into the next decade.

In exploring future directions for automated information services, the Committee members researched and wrote papers on the following topics:

1) the user

2) information

3) access to information
   a) means and technology

   b) the role of libraries in the future

   c) the role of librarians in the future

   d) macro and micro organizational considerations for libraries in the future

   e) fiscal considerations.

These essays are attached to the report as appendices.

The body of the report consists of a series of recommendations organized under each of the broad topics outlined above. As a whole, these should be considered as a plan to guide the University Library through the upcoming decade.

Philosophical Outlook

Underlying the recommendations are several principles which guided the Committee in its deliberations. Premier among these principles is the concept of utilizing informational technologies to enhance levels of service to users. The Library will aggressively seek to integrate electronic information transfer capabilities as they become available, feasible and cost-effective. Two major goals became clear in the course of the Committee's discussions: (1) to supply information in all forms to users on a no-charge basis, and (2) to establish the University Library as the primary information center on campus. A prevailing thread through the Committee's deliberations was the recognition of the extraordinary demands that will be placed upon library managers in the next decade. Library administrators must carefully choose a path which will take advantage of developing technology without losing the benefits of traditional information control. Difficult decisions must be made. A delicate balance must be struck, for instance, in allocating funds for purchasing printed materials and providing online access to users. Finally, discussions of the library user dominated every topic investigated by the Committee.

Users

Within the next twenty years, the definition of the Texas A&M University user group will change significantly. Technology will extend the sphere of the Library's influence beyond present geographical boundaries. Future users will be more computer literate than users of today and will be more demanding of the benefits available to them from computerized services. User

training in new information technologies will be a critical issue facing librarians in the upcoming decade. Librarians must be prepared to train several levels of users who will have varying levels of sophistication in automation.

It can be expected that some users will continue to need the most basic of instructions in library use, while others will seek proficiency in online searching at varying levels of difficulty. Thus the teaching function of the academic librarian will not diminish in the future; the need to acquaint the uninitiated with informational resources and their access will remain a significant function of the librarian into the foreseeable future.

Although the use of improved technologies will foster the growth of the University Library's user group, levels of responsibility to the varying segments in the expanded user group will not be equal. Roughly speaking, users in rank order of priority might be considered as follows:

1) students (former and present), faculty and staff of the Texas A&M University College Station campus;
2) Texas A&M University system personnel and students;
3) HARLIC (Houston Area Library Consortium) users;
4) local area residents;
5) Texas state residents;
6) U.S. residents;
7) international users.

## Recommendations

### The User

1) An emphasis should be placed upon user training during the transition from a print to an online mode of information transfer.

2) The University Library should strive to offer remote access capabilities to local bibliographic databases and to other automated databases.

### Access to Information

### Means and Technology

1) As is practical and feasible, the University Library will substitute electronic access for information sources previously published in printed form. Little used and/or expensive titles will receive first consideration for such substitution. Cooperative purchases of electronically stored information will be considered.

2) Full document delivery to campus users should be instituted as soon as remote access to local bibliographic files becomes commonplace. The viability of a full document delivery program should be phased in by offering services to West campus users in the near future.

3) The Library should aggressively pursue options for providing electronic access to uncataloged collections.

a) The use of commercial databases for providing partial access to some uncataloged collections, e.g., NTIS and U.S. documents materials, should be expanded.

b) If an uncataloged collection is viewed as a suitable candidate for cataloging through a cooperative project, the

Library should not catalog it locally. The Library will seek to engage in cooperative cataloging projects to fulfill a professional responsibility and to gain access to cooperatively produced machine-readable bibliographic data.

c) The Library should provide local access to all uncataloged materials considered unique or otherwise unsuitable for bibliographic control through multi-library cooperative projects. Local access assumes a wide range of bibliographic control. Some categories of uncontrolled materials should be assigned an indexing type of access, while others should be assigned partial or full cataloging types of access.

4) The Library will provide remote access to materials housed in the Library and to other material available through library services.

5) The Library will provide the means for users to serve themselves when technology permits through the performance of their own searches.

6) The Library should assume responsibility as principal agent for obtaining funds and resources, and for providing services in satisfying informational needs of users.

Access to Information

Organizational Considerations

Macro Considerations

1) Printed and electronic versions of the same information should be bibliographically controlled together. The format or form of information will not be the overriding organizational determinant; the substance of the information will prevail.

2) Job descriptions for library staff should be rewritten to include some combination of computer literacy, an emphasis upon subject specialization when appropriate and other non-traditional skills.

3) The Library should evolve in tandem with the application of information technologies and user needs. Flexibility and innovation in organization will be of extreme importance now and into the future. Specific needs and their significance to the Library organization can be expected to change quickly and radically. Staff should be allocated in light of need; a continual reassessment of staff needs is recommended as the environment changes. Staff should be moved as dictated by demand. Organizational models other than the traditional pyramidal structure, e.g., a matrix pattern. should be considered in light of future needs.

Micro Considerations

1) A fund raising unit should be established in the Library to generate the large amounts of funding necessary to purchase equipment for automated services and other needs.

2) An automation staff person should be added to deal with Public Services information systems.

3) The Library should strive to participate as a leader in networking and similar cooperative systems, e.g., bibliographic utilities, and regional and national automated informational services.

4) The Library should strive to become a center for storing and servicing data files. Other campus facilities involved in working with such files should be coordinated through

the Library in order to maximize use of funds and staffing and to ensure the concept of centralized information control.

5) The Library should strive to take advantage of new technologies and to participate in new modes of information distribution as available.

The Role of Libraries

1) The Texas A&M University Library should promote flexibility in moving from a print-on-paper orientation to an online access mode of thinking. Libraries as warehouses of printed information will decline rapidly in relevance in the next decade.

2) The concept of the library without walls should be tested immediately by offering remote access to Data Phase and full document delivery services to West Campus users.

3) Planning should begin immediately for the construction of a new building to satisfy space needs of the Library. While new technology will provide more efficient means for storing data, it cannot be relied upon to solve all of the Library's space problems. The concept of off-site technical processing should be explored.

4) The Evans Library Building should be immediately reassessed and reviewed for space utilization in light of new technologies and changing staff and user needs.

5) Patterns of collection development should be redirected to include the following principles and/or concepts:

a) Collection development efforts shall emphasize the acquisition of space-saving formats such as micro and electronic

formats with maximum retrieval capabilities.

b) On a case by case basis, the Library should eliminate expendable materials, e.g., print duplicates of journals and indexes available online.

c) Materials budget allocations should be expended with the uppermost goal of satisfying user informational requirements; i.e., access to information will be the critical issue in the future and not the storage of information in printed form.

d) The Library should become a center of an automated information network on campus.

The Role of Librarians

1) Funds and time should be allocated to retraining professional staff in automated information applications as they become available.

2) In view of technological advancements and the University's emphasis upon graduate education, there will be an increased need for subject specialization in the professional staff. As a result, an increased emphasis should be placed upon recruiting staff with advanced degrees in addition to an MLS.

3) The Library should bring pressure to bear in the profession at large to train library science students in innovative information technologies.

4) The Library should place a high priority upon becoming nationally competitive in salaries in order to attract the most qualified people.

5) Staffing needs should be continuously reassessed in light of service needs.

## Fiscal Considerations

### Introduction

To provide automated services to users on a regular basis, it will be necessary to reconsider traditional library budgeting philosophies. Materials budget lines might be renamed "Acquisitions and Access" lines to conform with a shift in emphasis from owning to accessing informational sources. It can be expected that there will be a gradual shift in the ratio of acquisitions and access budget lines from acquired printed sources to access services over the next ten years.

The consideration of charged vs. no-charge services will be of great importance. Eventually, the Library should supply information to users on a no-charge basis no matter how the information is accessed or acquired. It will be of some sigrificance, therefore, to allocate regular sources in the Library's budget for access services. A gradual, phased-in approach to incorporation of access services into the mainstream of library services will be based first upon the consideration of feasibility and practicality both in terms of funding and staffing. In forecasting a phased-in approach the following recommendations could be made:

1) The graduate student AIRS (Automated Information Retrieval Service) program begun in the fall of 1983 should be continued and expanded.

2) There should be an increased acquisition of backruns of periodicals in microformat; de-selection of hard copy equivalents should progress in tandem with acquisitions in

microformat if use patterns allow.

3) On a title-by-title/case-by-case basis substitute access to online indexes for print subscriptions.

4) The Library should provide dial-up access or unlimited in-house use of databases for which the Library would pay a fixed fee for unlimited access.

5) The Library should provide current awareness services.

6) Non-bibliographic databases should be made available to users on an unlimited access basis if cost-effective and feasible.

7) Full-text databases should be made available to users on an unlimited access basis if cost-effective and feasible.

8) Acquiring databases and allowing users unlimited access in the local environment should be considered.

9) In view of the change in emphasis from owning to accessing, the Library should recommend that ARL consider access budgets, e.g., funds spent on automated information retrieval services and the number of databases accessed, as significant statistics in determining library quality which should be compiled, analyzed and disseminated as part of the ARL Statistics; particularly as a variable in the ARL Library Index.

10) The Library should allocate additional staff positions to meet the increased demand for automated services.

11) The Library should allocate funds for professional staff development for retraining, updating skills, and providing opportunities for staying abreast of developing technologies.

12) The question of access to electronically transmitted

information gives rise to the problem of supplying copies (printed, tape, diskette, etc.) of information accessed online to users. The Library should gradually move to providing copies of such information on a no-charge basis. Again it can be expected that such duplicating services will be phased-in as practical and feasible.

Subject to copyright restrictions, duplicating services would be provided for the following:

1) Automated Services

   a) Holdings from the online public catalog

   b) Circulation information

   c) Information from bibliographic utility obtained through public access terminals

   d) Online printing charges for bibliographic data, full-text and non-bibliographic data

   e) Offline printing charges for bibliographic data, full-text data and non-bibliographic data

   f) Information retrieved from databases

2) ILL services

3) Microtext materials

4) Audiovisual materials

5) Software

6) Xeroxing of printed materials

Appendix I

# THE USER

## Introduction

Libraries find their raison d'etre in serving the informational needs of a body of users. In discussing the future of information services at Texas A&M University it is fitting to begin with a discussion of the users of those services. Within the next two decades both the composition of the population of users served by the Texas A&M University Library, and their needs for information will change dramatically. Change will result from the technological revolution in information services and demographic factors.

## Users - 1984

In 1984 the user population at Texas A&M consists primarily of students, faculty, former students, affiliated research personnel and a handful of community borrowers residing in the Bryan/College Station vicinity. An extended user population includes those who utilize ILS services and any library using cataloging copy input into OCLC by Texas A&M.

## Demographic Factors

Demographic factors will seriously affect the status quo in defining the Texas A&M user population. The post-World War II baby boom spurred tremendous growth in institutions of higher learning in the 1960's and 1970's. As the children of the baby boom move into middle age, the demography in student enrollment in American colleges and universities is changing substantially. The reduction in the student age population is accentuated by the

continued population migration away from the industralized northeast to the sunbelt.

Faltering economic conditions also play a role in contributing to the decline in student enrollment. Less federal money is available for student loans and graduate research. Although inflation has been slowed to nearly a standstill, higher education is still reeling from the inflationary spiral of the 1970's due to delayed increases in educational costs. As a result of escalating educational costs, students may defer graduate school until later in life when it is more affordable--a factor which will contribute to the aging of the student population in the next two decades.

The students of the 1980's and 1990's will be "earners" not "learners." They will prepare for making a living not for life. The pragmatic curricula offered by Texas A&M will probably continue to attract students in numbers which defy the national averages. The average age of those students may be somewhat higher than in 1980 as prevailing social trends take hold:

1) An extended life span may spur older people to return to school for training for second careers,

2) Economic forces which created "structural" unemployment will motivate those who never attended college, or those who did whose jobs are now obsolete to retrain for high technology fields,

3) Middle-aged women who are embarking upon careers after their child-raising years will return to school for training.

Universities will expand continuing education offerings for professionals in the field who cannot return to school full-time.

Although a significant percentage of the graduate enrollment at American universities is comprised of foreign nationals, that

percentage has been projected to increase to 10% of the total graduate enrollment by 1990. These students are enrolled in high technology and business curricula. Ninety percent of all graduate students in petroleum engineering programs in the United States are foreign students from OPEC countries. The United States is, and can expect to continue, training the Third World elite.

While Texas A&M may not experience a drop in student enrollment at the same rate as other institutions of higher education in the United States, the effects of demographic forces at play cannot be expected to bypass the University altogether.

Technology: a Contributing Factor to an Increase in the User Population

Technology will affect both the definition of the user population at Texas A&M, and the needs of those users. When an online catalog becomes a reality, access to the collection at Texas A&M will be significantly enhanced. At first the Library may experience an increase in library use from off campus TAMU System library users, e.g., Agricultural and Engineering Experiment Station users. The size of national bibliographic databases, (OCLC, RLIN) will make it imperative to create regional bibliographic database centers to disperse the demand upon single site facilities such as that of OCLC in Dublin, Ohio. Regional centers would first search to determine the geographical proximity of a loaning institution to a borrower for interlibrary requests. The Texas A&M University Library may become the regional resource center for subject areas, primarily science and

technology, which other regional institutions do not routinely collect. Thus the increasing sophistication of technology in the library setting will expand the core group of users of the Texas A&M University Library, and the number of users can be expected to rise.

Technology: a Factor Contributing to Changing User Needs

Technology will not only contribute to creating a larger user base for the Texas A&M University Library, but it will also alter user needs for information services. These needs will be most dramatically changed for users, faculty and graduate students involved in intensive research. According to one scenario, the roles of publishers and libraries can be expected to blur as new technologies become commonplace. Some information transfer, particularly of a scientific-technological nature, would bypass a paper medium altogether from the original draft through publication. The distribution of technical reports is a prime example of a function which would be substantially enhanced by such a system.

Students will be as equally affected by advances in information technology as researchers. Altered learning modes will emerge. There will be a movement away from the lecture--textbook--Reserve Room structure to self-learning systems. There could be a blurring between computer-assisted instruction and library informational services.

Users will demand library services from remote locations--office or home locations via microcomputers, portable terminals and even interactive television sets. The physical need to walk

into the library to access information will be substantially reduced.

Conclusion

Whatever technology has to offer and is economically feasible will be what the Texas A&M University Library must offer its users. In a few years college and university students who grew up with computer technology as readily available to them as television sets were to the present generation will be demanding library services. It is doubtful that they will accept answers gleaned from flipping cards in card catalogs, and pages in printed indexes.

Since it is very difficult in 1984 to predict with any certainty what forms of technological improvements in information transfer will become the most common, most economical and most preferred, defining specific user needs is an uncertain process. Some user needs are well understood, however, and the adoption of new technologies in the immediate future should address critical user needs for access to bibliographic citations, facts and specific data, full text and, finally, a means to organize and process information. The Texas A&M University Library must be ready to provide services which complement new learning styles, and to make itself amenable to changes in research methods and information access from technological advances.

Appendix II

# INFORMATION

## Introduction

When discussing future information services, it is useful to take into account the actual information to which the Library will be providing access.

In the future, there will continue to be primary, secondary, and tertiary information which will generally be in numeric, textual, or bibliographic form, or a combination of these. There will continue to be a proliferation of information available. New forms of information may become available. Systems for electronic transmission of information will allow the rapid dissemination of informal and/or ephemeral information. Newsletters and informal research reports that were once infeasible to generate or store because of cost restraints will be available online.

Users' requests for information will become more sophisticated with the Library's increased ability to retrieve information whether it be physically held in the Library or not. New technology will provide more sophisticated access and will allow for more rapid and specific retrieval of information. Different formats of information will be appropriate for different purposes.

## Formats

### Print Material on Paper

Over half of the Library's holdings are print materials on paper, and there will continue to be materials in this format in the future. However, the Library may see a decrease in the

proportion of print materials on paper to other formats, most notably computer storage devices. Some materials and collections will continue to be available only in print.

In general, publishers of serials will not risk investing exclusively in electronic publishing until they are assured that it will be economically feasible. Problems must be addressed, such as whether an "article" published in an electronic journal will be refereed and by whom, who will do the editing, and who will be allowed access to the "article" during and after the process. Publishers are also having difficulty deciding on pricing structures.

There will be some material available in electronic form to which the Library may wish to provide access because it is not currently available in any other format. The Library may opt to provide electronic or other nonprint access to material for which there is low demand.

Manuscripts

The Library collects Texas A&M University theses and dissertations, technical reports, and unpublished works in manuscript form. Local materials available only as manuscripts will continue to be collected unless the Library deems it necessary for space or other reasons to store them in another format.

Microforms

Microforms in the Library include:

a. information not available in any other format,

b. back-up copies of high-use materials (e.g. popular serials) and backfiles of very low-usage materials,

c. replacements for deteriorating materials,

d. and collections which are rare and/or expensive to purchase in paper copy.

In general, microforms are an economical medium for purchase and storage. However, there is still a need for further development of quality color illustrations and other nonprint images in microform. Microfiche and microfilm will continue to be available, although microcard, microprint, and ultrafiche are now fairly uncommon.

Sound Recordings

Audiotapes and discs are purchased by the Library on a relatively small scale. Because certain types of information are desirable in an audio version only, sound recordings will not become obsolete in the near future.

Videodiscs

Videodisc technology is still in a developmental stage but promises to provide a versatile format which will be important because of its ability to combine different types of information (still and motion pictures, text, and sound). Some materials, in which visual as well as textual information is needed, will be published as videodiscs. The videodisc is an excellent mass-storage device, capable of storing up to 108,000 still frames on one disc. Videodiscs are durable and virtually indestructable and allow random access and freeze-frame capabilities.

Videotapes

The Library purchases commercially available videotapes and houses some locally produced material. Most information found on videotapes will not be replaced by another format in the near future for several reasons: 1) information is easy to record on

videotape for locally produced material, and 2) most of the material available on videotape is not yet available on videodisc.

Much of the material available on videotape is also available on film but videotapes are easier to handle and are often less expensive.

Films

Films and filmstrips may become less important to libraries and may be replaced by either videotapes or videodiscs which are easier to handle and are more versatile.

Slides

Most of the Library's slide sets are locally produced. Some commercially produced slides will probably be replaced by videodiscs in the future.

Kits

A kit is defined as "a collection of resources including more than one type of medium intended for use as a unit and in which no one medium is clearly dominant." (Lynch, 173) Because kits are a combination of formats produced for a certain purpose (usually for teaching), they probably could not be effectively replaced by another format.

Realia

Realia are defined as "tangible objects that are real items (as opposed to representations or models) as they are without alteration." (Lynch, 189) Realia, as a kit, is a distinctive format and cannot often be effectively replaced by any other.

Files on Magnetic Hard Discs

Hard magnetic discs will be used for databases, for the Library circulation system, for the public access catalog and for other large data files. Although more expensive than magnetic tapes, magnetic discs allow random access.

Files on Floppy Magnetic Discs and Diskettes

The Library uses floppy discs and diskettes for several purposes including word processing and storage of computer software. While floppy discs and diskettes store less information than hard discs, they are less expensive and easier to handle. The Learning Resources Department makes extensive use of floppy discs and diskettes for microcomputers.

Files on Magnetic Tape

Magnetic tapes are a common means of storing machine-readable data; however, the Library does not generally acquire information in this format unless unavailable in another format because programming is required in order to utilize fully the material on the tapes.

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Appendix III

ACCESS

Means/Technology

In order to understand the possible impact of technological advances upon libraries and their users, one must first understand the various improved methods of storing and managing information which are evolving because of other, nonlibrary related developments. This section outlines technological developments in the context of their applicability to information production, storage and retrieval. Five areas will be discussed: large computers; microcomputers; terminals and home electronics; data communications; and memory and storage. All of the above areas will have an impact on the future of libraries, and the largest impact may well be from the combinations of them rather than from their individual contributions.

Large Computers

In the future, large computers, including all computers larger than microcomputers, will be used for two primary purposes: large numerical computations and management of central data banks. Calculating speed is expected to increase a hundredfold over the next ten to fifteen years. In 1970, the largest processors performed ten million operations per second; today, they perform 100 million, and by 1990 there will be a processor that will perform one billion. During this same period, there will be a continuing rapid increase in the power of very large computer systems. It has been predicted that the cost of computing will drop by a factor of more than 100 during the twenty-year period from 1970 to 1990. If this projection holds

true, the million dollar computer of the 1960's will cost less than a thousand dollars in the late 1980's. (Kubitz, 144)

These faster, more powerful large computers will be used in the information field for the storage of extremely large data banks, whose central resources are drawn upon by users, including libraries. It will not be necessary for all data to be physically located in one place, as various parts of the data bank can be linked by high-speed data communication links. Libraries themselves may serve as data banks, providing online catalogs, locally produced indexes, as well as the full text of unique items not held by members of cooperating library networks.

Microcomputers

A microcomputer is any computer which uses a microprocessor, a complex single chip, as its processing element. Large sixteen and thirty-two bit microcomputers are capable of performing functions previously relegated to more expensive minicomputers. Progress in integrated circuit technology, the process by which electronic components are printed on small chips of silicon, has resulted in increased speed and decreased cost for logic components. There has been a steady shrinkage of the size of computers from assemblages that filled a room to the current desktop versions. (DATAPRO, 104)

The distribution of computing power through the use of microcomputers will increase the amount of data captured at the source and stored in computer-readable form. New, easy-to-learn programming languages will increase the number of people who will use computers directly without recourse to an intermediary

expert. The shift away from procedural languages to query systems allow a questions-and-answers mode. With the development of speech input and output it is even possible that the man/machine communications will be a spoken dialogue.

What is significant about the proliferation of microcomputers is that they permit automation in areas which were untouched by earlier automation efforts because costs were prohibitive. In addition, the microcomputer is a transitional device, representing the first phase in personalizing or humanizing computer use. Currently, libraries use microcomputers for three purposes: administrative and fiscal office functions; bibliographic and word processing, and user services. (Chen and Bressler, 86)

Home Computers, Terminals, and Videotex

Many homes already have small computers or computer terminals, and other homes have telephones and television sets that can be equipped with computer control. These devices will provide a means of accessing the universe of electronic information from the home or office. Home computer owners now access a rapidly growing number of databases. Not only are more people learning to interact with computers, but they are being conditioned to expect to obtain instant access to an incredibly wide variety of information.

The microcomputer is being integrated into the communication pattern of the future. It's use possibly will alter the role of educational institutions. Interactive home video computers in the future will provide new possibilities for personalizing the

educational process. Students and teachers of the future will use microcomputers or smart terminals in many different ways: to receive and transmit text; to search for text or specific data; to build information files; and to communicate via electronic mail. It is quite likely that members of the academic community will obtain information from sources other than the university library. (Lancaster, 346)

In contrast, videotex/teletex services have yet to make a significant impact in the United States. However, the development of cable TV systems may give videotex/teletex services a chance to attain the large-scale operations necessary to be cost effective. Videotex is the delivery of text and graphics from a computer, through a wide variety of electronic systems, in response to a user's command. Teletext utilizes a continuously cycling sequence of "pages" transmitted to a user's television set. (Adams and Adams, 206) By the late 1980's, television manufacturers probably will include a computer as part of the standard television set.

Data Communications

Information retrieval will be furthered by advances in communications technology. Currently, the relatively high cost of traditional communication channels has retarded the exchange of nonbibliographic data among libraries. However, the rapidly increasing availability of inexpensive digital data communication through specialized networks such as Telenet and Tymnet are motivating growth in the use of distributed data communication services. Telephone lines with optical fibers will reduce

enormously the cost of communications. New satellite-based services will add much needed competition to bring costs even lower. Yet, futurists will not predict whether it will be cost-effective to transmit a book to a user's home, or whether it will be better to provide it in disk form for the user to pick up at the library. Another problem with transmission is the large amount of writable storage that would be needed at each user's home.

Electronic mail is beginning to be used by libraries. Electronic mail provides rapid transmission of messages among microcomputers or terminals of larger computers. A message can be composed, edited and transmitted in minutes. Libraries have experimented for a number of years with facsimile transmission of documents. Costs still are too high to allow most libraries to utilize facsimile transmission extensively.

As the technologies develop, the possibilities for interlibrary communication, library-publisher communication and patron-library or patron-publisher communication begin to mushroom. Yet, at the present, it is practically impossible to predict what the interrelationships between the different technologies--cable television, satellites, viewdata/videotext, facsimile, etc.--will be, or which technology will prosper at whose expense. As Efrem Sigel states, "Telecommunications technology is neutral: it is a carrier of information. . . . Thus, it falls to the suppliers and users of information--publishers, libraries, individual readers and viewers--to determine what use they will make of different communications channels." (Sigel, 3)

Memory and Storage

Rapid progress has been made in data-storage technology. The trend is towards more and more complex processor and memory components packed into smaller and smaller circuits. The current sixty-four kilobit solid-state random access memories are expected to be superseded soon by 256 kilobit ones, capable of storing 262,144 bits of data on a chip measuring 5 mm by 9 mm. Several other higher density storage media are being developed. (Zorkoczy, 81)

Many new mass storage technologies, including video disks, are difficult and expensive to write, but very cheap and easy to reproduce and read. Erasing and rewriting often are impossible. Costs per bit of storage for archival applications are low enough to be competitive with paper storage. According to a recent report from DATAPRO, "Incremental improvements over the next decade should strengthen this advantage and stimulate a trend toward permanent document storage in electronic form." (DATAPRO, 107)

The Future

Today, it is impossible for librarians to envision how much impact technology will have on libraries in the future. There are, however, certain trends that seem inevitable.

The new technologies are pre-emptive and will displace traditional methods and techniques. (Thompson, 73)

Technology will continue to develop. Bigger, better, cheaper and more powerful devices will appear. The many options available will make it difficult for librarians to select the

most appropriate for their needs. (Chen and Bressler, 184)

Computers have and will continue to revolutionize the transfer and use of information. (Chen and Bressler, 184)

Information interchange will be furthered by advances in communications technology. The technical distinctions between information technologies will be obscured. The various technologies will become interrelated. (Branscomb, 35)

Pressure from patrons for more current information will increase.

Indexing and abstracting services, as well as compendia of data, increasingly will be offered only in machine-readable formats. Literature itself, particularly in the humanities and social sciences, will continue to be available in print form. (Thompson, 81)

The effect of technology will be evolutionary, rather than revolutionary, in that the time period will be rather long. The transition to heavy utilization of electronic media may take from five to ten years. (Marovitz and Emard, 15)

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Appendix IV

ROLES OF LIBRARIES AND LIBRARIANS IN THE ELECTRONIC AGE

Libraries are intrinsically social and cultural phenomena. Thus, it would be erroneous to consider libraries and librarians in a vacuum in forecasting their roles in the electronic age. In 1983, the socio-cultural backdrop against which libraries must be viewed is intensely colored by the upheaval brought by 20th century technological advances.

At the beginning of the 20th century, most Americans were employed in the agricultural economy. By mid-century and directly after World War II, the vast majority of Americans were engaged in industry. Since the end of World War II, there has been a steady migration of Americans away from industrialized activities to information-related endeavors. As a matter of fact, today more than half of the American population is employed in the service economy, and over 50% of the gross national product in the United States is spent in service industries. (Lancaster, 2)

The rapid growth of the service economy has been largely fueled by technological change. Technology has experienced a rate of growth unprecedented since the Industrial Revolution. In the past four years alone, the speed of data processing has increased by a factor of ten, while costs associated with data processing have declined by the same factor of ten. (Diebold, 6) It is important to remember however, that major advances in technology have seldom received universal acceptance during and immediately after their development. The environment must be proper for technological advances to take root; although it is

technologically feasible to fly to the moon, not many men have been there. Generally speaking however, the social, commercial, economic, and cultural environment in the Western world in the recent past has provided a fertile seedbed in which technological advances have taken root and prospered. In considering the future of libraries it is important to remember that, while the futuristic image of the library may be technologically feasible, the electronic library is far from practical implementation in 1984. Before the library of the future emerges, advanced, appropriate forms of technology must become both economically feasible and an integrated, familiar part of the American life-style and culture. The impetus required to move libraries into the electronic age consists of a variety of socio-cultural and economic forces operating in tandem.

When will these myriad forces at play give rise to the visionary's view of the library? Alvin Toffler provides one view in The Third Wave. The Third Wave in which the world is presently immersed will, unlike earlier movements, be completed in a few short decades. Doomsday prophets at the opposite end of the opinion spectrum predict that mankind will not survive to enjoy the fruition of the Third Wave. (Toffler, 26) Of neither a revolutionary nor a despairing bent, most librarians see the truth falling somewhere in the middle; electronic libraries will neither spring up overnight like mushrooms, nor will the world be subsumed in the flames of impending disaster. Libraries will move in parallel with society into the electronic age; they will evolve over time applying electronic solutions whenever practical.

Libraries have not allowed the advent of electronic data processing to pass them by. For roughly the past fifteen years, librarians have applied electronic means to alleviate the drudgery in their most detailed, labor-intensive processes. Circulation, acquisitions, and cataloging activities are automated, at least in some measure, in most large academic libraries in the United States. Presently, most research libraries are in the midst of planning and implementing online catalogs.

Although online catalogs are, in most instances, merely machine representations of the bibliographic data in card catalogs, they embody a shift in emphasis in library automation from technical processing applications to enhancing access to information. After a decade of grueling coding of traditional cataloging data in several versions of MARC format, librarians are pondering the myriad possibilities for access afforded them through manipulating the painstakingly delimited bibliographic minutiae on OCLC and RLIN archive tapes. Using Boolean logic to manipulate the data in cataloging databases represents a significant improvement in access over that available in the card catalog.

The true revolution in library automation however, is represented in the various online indexing systems made available by commercial vendors. Keyword searching capabilities utilized by such systems represent a true departure from access mechanisms in printed reference tools. As libraries adapt themselves to the computer age, such systems will become more sophisticated.

Cataloging in the traditional sense, governed by rules written for print access on 3x5 cards, will be replaced by systems that index huge amounts of data with little effort at the input end. Optical Character Recognition (OCR) capabilities will allow librarians to expand the definition of "cataloging" data well beyond its present limitations.

The traditional roles of libraries and librarians will change in parallel to advances in technology. In the past, librarians have fulfilled several functions in their roles as guardians of mankind's written accumulated knowledge. They have selected and stored information for their user groups, organized and controlled that information so that it could be found and used by their patrons, and provided sophisticated informational services.

As electronic means of access and storage become more common in American society, the ability to tap a source stored electronically will transcend the need of a library to own informational resources. The library as an institution which stores and organizes printed information on shelves will decline in usefulness. The expensive guesswork involved with selection on the basis of a possible, future need will be alleviated by on demand electronic access to information.

As libraries evolve in the information age, allocation of scarce financial resources will undergo a shift in emphasis. F. W. Lancaster in Libraries and Librarians in an Age of Electronics notes that library budget allocation is already showing signs of the emphasis of automation activities over collection development:

> The major trend so far is the growth of electronic publishing, and the continuing conversion, within libraries, from capital investment in printed publications to some form of online access on demand.

In some cases electronic transmission of information is becoming less expensive than print-on-paper publication. There is no reason to expect this trend to reverse itself or to slow; just the opposite is true. With print, publishers are subject to revenue losses by widespread copyright violation. Electronic transmission of information can be carefully controlled by publishers and revenue can be retrieved for each transaction. As electronic publishing becomes more economical for publishers, per capita printed publication will become more expensive as libraries drop paper subscriptions in favor of electronic access.

Widespread use of terminals in the home and improved telecommunications will alleviate the need to travel from physical location to location in performing routine daily tasks. There is no reason to believe that libraries will escape this trend, and it can be expected that library users in the future will have access to informational resources through home and office terminals. Librarians themselves, with other segments of American society, may find no need to commute to work. In a recent article in Forbes, "A Job with a View," the concept of telecommuting is introduced:

> Welcome to the wonderful phenomenon of telecommuting, which promises to change the daily lives of millions of Americans as radically as the automobile did beginning a half century or so ago. As with cottage industry of old, with telecommuting the job is coming to the worker

> rather than the worker to the job. It's early in the trend, but quite clearly, something big is afoot. (Forbes, 144)

As electronic sources continue to gain in importance and paper sources to decline, as terminals become more common in homes and offices, and as people become familiar and comfortable with the use of online resources, the need to visit libraries will begin its inevitable decline. Lancaster predicts that technical services in libraries will be the first area to dwindle rapidly: electronic sources will not need to be selected, acquired, cataloged, and preserved. Public services will also decline; as terminals become widely available, potential users will not need to travel to the library to consult information sources or information specialists. When large amounts of fulltext information are available in electronic form, there will be little need to visit a library to borrow materials.

Librarians today are presented with a remarkable and exciting challenge but one which shakes the very roots of their beings. Libraries are going to change and librarians with them. How to prepare for change is the crux of the dilemma which librarians must face. In order to prepare for change, librarians must predict how libraries will evolve. Lancaster forecasts that libraries will undergo an evolutionary process as follows:

1. Libraries provide much the same type of service that they do today. Their internal functioning, however, is greatly improved through technology, such as microform storage and the application of computers, and they deal with an ever-increasing diversity of materials.

2. Networking activities, facilitated by computers and telecommunications, improve the effectiveness and cost-effectiveness of library service in general and make every library a point of efficient access to a vast national library resource.
3. Libraries reduce or even eliminate dependence on print-on-paper and deal primarily with resources in machine-readable form.
4. The need to visit libraries declines as technology permits libraries to deliver services directly to offices and homes.
5. Local libraries decline substantially in importance, or even disappear, as individuals can access information resources directly through telecommunications, regardless of where these resources happen to be. Individuals can build and store their own personal information files in electronic form.
6. Individuals become members of online "intellectual communities." The distinction between formal and informal communication tends to blur, since online networks provide access to individuals (electronic mail, computer conferencing), as well as to a wide variety of information sources in textual and other forms.
7. New information service capabilities emerge, including the ability to query data banks that will answer questions directly (rather than referring the user to another source) or even deduce answers to questions. (Lancaster, 125-26).

By the year 2000 it is conceivable that the library as an institution will cease to function as the center of information transfer in American society. The bustling library buildings of 1983 may become quiet, hallowed archives in the future.

Although the library as it exists today seems headed for inevitable decline, the role of the librarian may be on the rise. The services of the librarian will transcend the library as an institution. Users in the future will no longer "go to the library", they will "go to see a librarian." In the electronic age, librarians or information specialists will act as intermediaries between sources of information and users. The information specialists will gain in professionalism and may finally attain equality with other professionals, a status librarians have long sought but one which has remained elusive. The librarian's job will evolve and take on new dimensions: the librarian "will not be displaced by powerful computers that tract, locate and deliver millions of bits of info per second; rather the computer will serve as a marvelously efficient tool that expands and changes the parameters of the librarian's job." (Diebold, 6) The future relationship between libraries and their users may closely resemble the relationship between public utilities and home consumers. (Diebold, 7)

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Appendix V

## ORGANIZATION OF LIBRARIES IN THE ELECTRONIC AGE

A leading theorist whose own vision of the future is one of a society whose formal communication will be paperless does concede that "some type of library service will still be needed." (Lancaster, 155)

These services have been summarized (Thompson, 109) as follows:

1. Libraries will be needed to provide online access to resources for individuals who, for one reason or another, do not have their own terminals.

2. Libraries will be centers in which trained personnel will be available to assist the user to exploit the resources offered by databases and databanks.

3. Libraries may serve as "printout centers" since high-speed printers may not be available to all users of terminals.

4. Libraries will continue to be chiefly responsible for the collection, cataloging and indexing of materials of purely local or very specialized interest.

5. Libraries will play a role in making accessible to a community of users, free or at low cost, materials for which some type of fee is charged by an electronic publisher.

6. Libraries, on behalf of their users, will construct profiles of interest which can be matched at regular intervals against the characteristics of documents newly added to primary databases.

7. During the transitional period (which could be many years) between present systems and an entirely electronic world, libraries will be involved in achieving some measure of integration between the processing of printed materials and the processing of electronic materials. Some level of processing in parallel will be inevitable.

The library that can find a central place in an electronic world will not only need to be responsive to change but will often need to be able to precipitate change. How the library is organized will influence the way in which it adapts to change.

Ideally, clearly defined goals and objectives for an organization should precede the organizing process. However, in an academic setting, mission statements for the institution are often lacking or difficult to apply in a practical way, leaving the library somewhat adrift and on its own in terms of developing its organization.

Organization is usually achieved by identifying and grouping similar or related required activities or tasks into units or departments. Peter Drucker suggests that it is not as important to identify all tasks that are required in an organization as it is to identify key tasks. (Stueart, 58)

With some variations, libraries have traditionally been organized in a hierarchical pyramid, with line positions having authority for decision making and staff positions that are advisory in nature. Bottom-up management and collegial management, while retaining the concept of the hierarchical triangle with the major authority at the top, are among some of the newer management processes in place in libraries. (Stueart, 71)

While the traditional principles of organization will still be applicable in the electronic library, the specifics will probably change. Some service units such as interlibrary loan may disappear altogether. And as automated services become an integral part of all traditional library functions there will be less need to have a separate unit for "automation." As more "user-friendly" databases become available instructional services will need to be expanded in order to equip users with the necessary skills to access the desired information. Change will

affect many of the current library functions and services. During the transition to the electronic library frequent review and evaluation of the internal organizational structure will be needed in order to maintain an effective operation.

Dr. Carlton Rochell, speaking on the organization of libraries in the 1980s, noted that as central online database becomes a reality, there is less need for separate relatively autonomous units, dedicated to discrete tasks and dependent on separate files. Lines dividing units blur as units become more interdependent. The online library will likely have discrete units, serving a particular function, but the interaction and communication will change significantly. (Rochell, tape)

Rochell also noted a trend for American institutions to abandon the "pyramid" structures for new patterns, including the "Japanese" structure, or a task force approach. Hugh F. Cline suggests a "matrix" approach:

> It appears that libraries may gradually be adopting a matrix organizational structure in which individuals have one major functional assignment to a library department or unit and simultaneously, one or more temporary, substantive committee assignments to work on specific projects or problems. This type of matrix organization may become more prevalent in university libraries, for many administrators report that it is especially effective in addressing technology-related issues.

Ken Dowling, addressing the ways in which computerization can affect the organization of a library, emphasizes the need for a well-defined mission. He notes that what has been lacking are library directors who are involved in macro-system designs as contrasted with vendor-designed systems for separate library functions. (Dowling, tape)

Other effects of computerization on organization which Dowling notes are:

1. Changes the skills required of employee.
2. Increases status and level of employees on the lower rung of the ladder.
3. Increases ability of professional staff to be professionals. (Larger percentage of cataloging done by technicians; professionals design the way it is done)
4. Average through-put time for processing newly received books is greatly increased. (Average 48 hours in Dowling's institution)
5. Permits the shift of a number of people from technical services to public services.
6. Provides an impetus for the implementation of a service of "computer learning circles" for staff.
7. Provides for increased control of resources.
8. Eliminates snags, books in limbo, etc.
9. Encourages innovation such as the utilization of microcomputers for employees' work stations.
10. Increases expectation for accuracy and reliability from patrons and staff.
11. Increases goal-directedness because system offers high level statistics, planning models, etc.
12. Increases service capability; makes many tasks possible.
13. Increases empathy. ("If computer is down, <u>everyone</u> has the same problem.")

It is Dowling's contention that computerization creates more shared values in a library. Employees have to believe in like things and view priorities similarly. The result is better-motivated staff and more efficient productivity. (Dowling, tape)

In the area of external organization, libraries will probably participate in more networks, but they will expect more benefits than they have in the past. The networks might range from a

national public reference service to a regional preservation and conservation consortium. On this subject, Richard de Gennaro has noted that: "In the 1980s library administrators will move to regain much of the control over their own operations and decision-making that they gave up to the networks in the 1970s." (De Gennaro, 634)

In the age of developing information technology, one task for libraries will be to influence the development of the policies regulating its use. Staff positions or committees may need to devote a great deal of time and effort to keep abreast of public policy affecting libraries. Other ancillary activities such as working with fund-raising groups or library friends groups will need to be revamped to accommodate needs that are different from exclusively developing book collections.

In a slightly different vein, but one of primary importance, the library administration will be under constant challenge to meet the competition from other parts of its parent institution to take over some of the functions now performed solely by the library. While the library will welcome some sharing of the functions, there is a need to retain some of the functions exclusively and to be involved in others which the University has only just "discovered."

The next few years should be very exciting and challenging for librarians in the academic setting.

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Appendix VI

FISCAL CONSIDERATIONS FOR LIBRARIES IN THE ELECTRONIC AGE

In considering the fiscal issues for libraries in the electronic age, two most frequently mentioned are the reallocation of funds from the materials budget to database services and whether the user should pay for all or a portion of the costs involved in an information retrieval search of computerized databases.

At a conference on the use of library materials in 1977, A. F. Trezza noted that just as there was a tremendous shift after World War II in the amount of the book budget a library might spend on journals compared to the amount that had previously been spent, a library might well decide that database services are so basic and so important that they deserve a priority in the budget at the expense of monographs or journals. (Thompson, 105)

Waters and Kralisz note in 1982: "Materials are materials and the library may wish to take its first venture into electronic data use by setting aside a portion of its normal materials budget, assigning them for 'electronic materials' and make existing online services available to its community." (Waters, 115)

If large amounts are taken from the materials budget for information retrieval services, the question arises as to whether the library should cancel printed indexes if access to the computerized database is available. Barbara Magnuson notes some practical concerns which most libraries would have to face:

> Few libraries have cancelled indexes that are widely used by patrons. There are two related reasons for this. First, it is generally impractical, at present, to train a large number of patrons to do their own searching; second, supplying the

> demand for searches in the absence of printed indexes is labor-intensive and would probably strain most libraries' resources beyond acceptable limits. (Magnuson, 736)

How will publishers react to the cancellation of printed indexes? Magnuson writes:

> Recently, Gail Schlachter, of ABC Clio, spoke on this topic to a group of librarians at the University of California, Santa Barbara. She said that most of the index and abstract publishers cover their costs by selling the printed product and then make whatever profit they can from online vendors' royalties. If all subscriptions to the printed version of America: History and Life were cancelled, she estimated that ABC Clio would have to increase income from online searching by forty-fold in order to support the cost of production. Lastly she believes there are certain searches that are more efficiently done in the print medium. (Magnuson, 740)

Information from the American Chemical Society regarding its journals available online confirm Schlachter's observation. It would simply charge libraries more for the use of its databases if the library did not subscribe to the journals.

It is expected by many observers that such concerns as these will resolve themselves as more libraries substitute online indexes for printed indexes. The problem of tables and graphs will need to be resolved also before some databases can replace their printed counterparts. Any new developments that make database searching easier and more accessible to users will also affect the choice by the library.

Lancaster and Goldhor note that the process of conversion from print to electronics will be accelerated by:

(a) simplification of search procedures to reduce the need for intermediates,

(b) increasing availability of terminals to provide ready access to online services, and

(c) changing attitudes among librarians regarding the proportion of the budget to be allocated to subsidizing print on paper access versus the proportion to be

allocated to subsidizing online access. (Lancaster, 310)

Who pays for the access and retrieval of information from online databases has been the object of several studies and the subject of numerous articles. One author notes:

> Future innovations in information services will probably come from the application of technology to the storage, retrieval, and dissemination of information. They will have significant and identifiable costs. The products will be highly specific and to the individual client's needs. And many will be aimed at making more effective use of the end-user's time. Libraries will have to decide what role (if any) they will play in making these services available, and who will bear the cost.
>
> In adopting online bibliographic searching, libraries have had to make decisions which have implications for these broader questions of fees and of innovative information services generally. (DeWath, 31)

In an ALA survey in 1981, 70% of 985 responding libraries charge fees for online services. Among the responding libraries were 445 university libraries. (Lynch, 10-11)

Lynch observed that from comments made by respondents it was obvious that most libraries using online services for "ready-reference" do not charge their users for this service. Also, it was obvious that libraries have generally been attempting to recover only direct costs. (Lynch, 16)

In trying to determine what, if any, charge should be made to the user for online searches, a number of factors need to be considered. Is the information available to the user at this library only online? Should it be available without charge to users who have grants for research for which this information will be used? Should the online charge for the database be a consideration? (Some searches done at the Evans Library during the past year cost the user from $700 to $1,000). Should the

library or the user pay offline printing costs?

If some funds could be budgeted for the purpose of reducing the cost of online searching to the user, a library could reasonably share more of the costs. A library, such as the Evans Library, has some obligation to be accountable, and it would seem that it would be difficult to justify spending $1,000 for a one-time use item for a single user.

How the Evans Library resolves the question of charging for searches will have a great deal of implication when user-friendly systems permit users to do their own searches. Considering the time users spend at the OCLC terminal, the Library might not be able to pay the bill if users could spend unlimited time in conducting their own searches. Of course, the costs here will all need to be balanced with anticipated savings in staff time (yet to be tested).

Some advocates of "free and equal" access to online databases feel that the free "access" takes care of the library's obligation for free service and that the user should then pay for all printing charges.

The question of who pays for database access from remote terminals in academic departments or from terminals owned by students or faculty must also be determined. This question does not seem to have been addressed sufficiently as yet.

Of course, the electronic age will bring about new costs for hardware and software and telecommunication services. It is anticipated that some of these costs will diminish during the transition period, however, maintenance costs may not. That a

library will need adequate funding to function in an effective manner is without question. Costs will be particularly high during the transition period, and ultimately effectiveness will probably cost more. (De Gennaro, 1046)

Regarding costs of the new information technology, De Gennaro observes:

> The increased benefits and capabilities that computer-based systems offer will not come without increased costs. When we first started to use computers in libraries 15 years ago, we thought we would save money, but we soon learned that there would be no net savings from automation....The sophisticated products of automated systems will cost more than the limited outputs of our old manual systems.... We are no longer merely automating our traditional library operations; we are multiplying our capabilities and raising the level of expectations of library staff and users alike. (De Gennaro, 1047)

De Gennaro further observes:

> Librarians have an urgent need to convince their local budget authorities, foundation officers, and corporate donors to provide the capital investment needed to complete the transition from manual to fully automated systems.... Additional investment capital will be required if libraries are to make effective use of high technology. (De Gennaro, 1048)

It is clear that librarians in the 1980s face a real challenge in trying to resolve some of the issues that need good decisions, decisions that will pave the way for a smooth transition to the library (with or without walls) of the future, and will assure that our society will have full access to the information it needs to function and which it expects as its right.

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